Occupational Cancer in Italy

Enzo Merler,[1] Paolo Vineis,[2] Diego Alhaique,[3] and Lucia Miligi[2]

[1]Epidemiology Unit, Center for Study and Prevention of Cancer, Florence, Italy; [2]Dipartimento di Scienze Biomediche e Oncologia Umana, Turin, Italy; [3]Istituto Nazionale Confederale di Assistenza, Rome, Italy

This article is a discussion of occupational cancer in Italy. The introduction provides the necessary context of Italian industrialization and occupational health regulation. This is followed by a review of Italian epidemiologic studies of occupational cancer risks considered in terms of relative measures of risk and attributable risk of carcinogenic agents or exposure circumstances. We attempt to establish the number of workers exposed to carcinogens in Italy and the intensity of their exposures. Finally, the Italian system of compensation for occupational cancer is discussed. Several cohort and case-control studies have addressed the issue of occupational risks, mostly among male workers. The results of these studies suggest that the growing incidence of and mortality by mesothelioma is explained by the widespread and intense exposure to asbestos in some Italian industrial settings. A high attributable risk of lung tumors among male populations in industrial areas of northern Italy is explained by occupational exposures. However, insufficient data are available for clear definition of the extent and intensity of occupational exposure to carcinogenic substances. In Italy, we must prioritize and maximize resources in occupational cancer epidemiology and revitalize the role of national institutions. Recent legislation has established new regulations on the handling of carcinogenic substances in industrial settings, a new list of occupational diseases, and a national registry of mesothelioma linked to asbestos exposure. These legislative changes are expected to have positive effects. — *Environ Health Perspect* 107(Suppl 2):259–271 (1999). *http://ehpnet1.niehs.nih.gov/docs/1999/Suppl-2/259-271merler/abstract.html*

Key words: occupational diseases, epidemiology, carcinogenic substances, epidemiology, asbestos, attributable risks, attributable fraction, compensation

Industrial and Regulatory Background

Industrialization

In Italy the Industrial Revolution began in the early nineteenth century, considerably later than in other European countries such as England, France, and Germany. It first affected the textile and metallurgical industries in the North. The production demands for the two World Wars accelerated industrial development, which progressed at a tremendous pace after the 1950s. Italy's entrance into the European Economic Community (EEC) in 1957 stimulated development of the automobile industry, mechanical and precision metalworking, and the chemical industry.

Thus, northern Italy developed an industrial structure comparable to those of other areas of northwestern Europe; southern Italy, however, retained its original agricultural orientation. This gap between the industrial development of the North and that of the rest of the country persisted, even though some large metallurgical enterprises and chemical facilities settled in the South.

Italy is remarkable for good manufacturing based on unskilled labor and for exploiting few of her own raw materials, although there has been mining of asbestos (chrysotile), bauxite, coal, iron, lead, mercury, pyrites, sulfur, and talc. Italy also has a longstanding shipping tradition, and there are dockyards in both the North and the South.

In the 1960s the Italian Industrial Revolution got a second wind in the rapid growth of small- and medium-size industries. Small firms producing the same product tended to cluster in particular areas. Large firms broke up into networks of smaller specialized artisan or family-run enterprises. These specialized enterprises employed local labor, so that particular areas became known for producing products such as ceramics, tiles, eye glasses, shoes, silk dyeing, furniture, or tinned food.

Thus, by the end of the 1960s, most Italian firms were small or medium size; 40% of the work force worked in enterprises employing 11 to 500 workers, and 3 million workers were artisans. In the 1970s, 7 million Italians were industrial workers, 1.2 million were employed in agriculture, 3.3 million in tertiary activities, and 1.8 million in public administration. A further 7 million were believed to be involved in the underground ("black") economy, meaning they worked in unregistered firms or without paying for social security. One million of these workers were working two or even three jobs simultaneously. Women were an important part of this underground work force (*1*).

Subsequent census data suggest that important changes in the distribution of the work force have taken place since the 1970s. Between the 1970s and the 1990s, the number of people working in office jobs doubled, and there was a 10% reduction in both the agricultural and the industrial work force (*2,3*) (Table 1).

Women worked in selected industrial and agricultural jobs but were virtually absent in other sectors. In some cases this was because these jobs were traditionally reserved for men and in others it was because of regulations. For example, women could not be employed in mining, in physically demanding jobs, or, during pregnancy, in jobs involving exposure to agents with a reproductive hazard.

In the early twentieth century and again during the autarchy era of the 1940s, poverty forced many workers and their families to migrate to other European countries or overseas. Between 1876 and 1985, 26 million Italians emigrated, mainly from the South and the mountainous areas of northern Italy. In addition, there was a great deal of seasonal and temporary migration of Italians workers, who thus became known as birds of passage. Abroad, they were employed in dangerous jobs, where they often contracted occupational diseases. An example of this is the persistence of high mortality rates in Italy due to silicosis (*4*). The economic boom of

This article is part of the monograph on Occupational Cancer in Europe. Manuscript received at *EHP* 27 July 1998; accepted 12 November 1998.

Address correspondence to E. Merler, Epidemiology Unit, Center for Study and Prevention of Cancer, via San Salvi 2, 50135 Florence, Italy. Telephone: 39 55 6263707. Fax: 33 55 679954. E-mail: epid@ats.it

Abbreviations used: AR%, attributable risk percent; AR_e, attributable risk percent among the exposed; AR_p, attributable risk percent in the population; EEC, European Economic Community; RR, relative risk;

Table 1. Enterprises and employees in Italy by type of economic activity at the 1981 Census (*2*), and changes recorded at the 1991 Census (*3*).

Classification of economic activities	No. of enterprises, 1981	No. of employees, 1981	Change in census % vs 1981: enterprises	Change in census % vs 1981: employees
Agriculture, hunting, forestry	25,931	82,321	98	91.9
Fishing, taking of fish, fish farm operation	6,581	26,380	129.4	95.8
Mining	6,830	61,889	83.9	78.5
Mining of materials for energy production	187	6,740	79.1	159.5
Mining of materials not used for energy production	6,643	55,149	84.1	68.6
Manufacturing	611,782	5,736,513	94.9	89.2
Manufacture of food, beverages, tobacco	61,007	485,123	112.4	98.2
Manufacture of textiles and of wearing apparel	141,709	951,020	74.4	86.5
Manufacture of leather and products of leather	30,609	276,799	90.1	88
Manufacture of wood and wood products	77,472	241,956	74.4	77
Manufacture of paper and paper products, printing and publications	26,353	286,177	120.6	99.4
Petroleum refineries, coke manufacturing, treatment of nuclear fuel	509	30,585	197.6	95
Manufacture of chemicals, manufacture of synthetic and man-made fibers	7,686	296,110	93.4	80.8
Manufacture of rubber products, manufacture of plastic products	19,894	222,027	66.6	80.8
Manufacture of nonmetallic mineral products	27,435	337,849	107.4	81.8
Manufacture of fabricated metal products	100,970	878,118	95.3	89.4
Manufacture of machinery and equipment inclusive of repairing	32,400	533,761	101.7	93.9
Manufacture of electrical machinery apparatus, appliances, supplies	35,236	520,519	152.2	94.3
Manufacture of transport equipment	5,899	419,571	109.5	85.4
Other manufacturing industries	51,258	310,805	112.6	101.2
Electricity, gas, water	8,492	172,041	81	102.8
Construction	329,265	1,192,398	117.9	111.8
Wholesale and retain trades; cars and motor vehicle repair	1,356,015	3,096,266	101.7	106.8
Restaurants, hotel	224,041	654,880	105.4	1121
Transport, storage, communication	194,607	1,148,489	81.8	97.6
Financial institutions	47,129	439,512	166.7	129.6
Real estate, business services	212,110	651,801	189.3	185
Public administration and defense, social insurance	30,482	703,810	97.6	113.9
Education	92,016	135,540	85	102.8
Medical health services	105,662	832,812	151.2	135.2
Other social and related community services	252,009	629,291	124.7	108

the 1960s changed the direction of migrations; instead of going abroad, southern Italian workers moved to northern Italy.

Regulation of Carcinogenic Exposures in Workplaces

Since its introduction, Italian legislation on workers' health protection has been dominated by the concept of technologic feasibility. The early model of worker protection stressed the need to update technology rather than the need to control levels of exposure in the factory. A notable exception was the introduction of legislation on mining and tunneling in the 1950s. The law required periodic measurement of dust and of the proportion of free silica in respirable dust, lung X-rays for exposed workers, and establishment of an independent body of inspectors. The data collected by these inspectors have never been submitted to formal validation except in specific instances. This indicates that the epidemiology of occupational diseases and exposure assessment was a low priority in Italy until the late 1970s.

Exposures were measured more extensively after the 1970s in response to union demand. The battle for a better work environment was thus limited to large factories, mostly in the North, in which the unions had a strong voice; i.e., it was limited to relatively few industrial populations.

The concept of acceptable levels was not introduced until the late 1970s, when EEC directives established acceptable levels for some carcinogenic agents such as asbestos, benzene, vinyl chloride, and some aromatic amines. Legislation was recently introduced on carcinogenic exposures at work. Only during the last 15 years has there been a decrease in intensity of exposures at workplaces; this has been documented in the cases of asbestos, mercury, and styrene (*5–8*).

Few chemicals have been banned in Italy because of their carcinogenic risk. In 1964 benzene was prohibited in the manufacture of glues and varnishes because of the high number of leukemia cases detected among shoemakers, printers, and rubber workers. Some aromatic amines were banned because of the high relative risk of bladder tumors among dyestuff workers exposed to *o*-toluidine and 4,4′-methylenebis(2-methylaniline) (*9*).

Other carcinogenic agents were prohibited for agricultural uses (arsenic, mercury, 2,4,5-trichlorophenoxyacetic acid), after similar bans had been applied in other countries. Finally, in 1992 Italy banned the production, commercialization, and import of all asbestos fibers.

Until 1978, a technical body of the Labour Ministry was in charge of inspecting factories and verifying the application of laws and regulations. At that time, the prevention of occupational diseases was a low priority because of limited resources and the prevailing emphasis on the prevention of accidents in the workplace. In the 1978 health reform legislation, the responsibility for the evaluation of occupational health was transferred to the Ministry of Health. Thereafter, a network of occupational health units was developed as part of the National Health Service. These units were aimed specifically at the detection and prevention of occupational disease and had the right to inspect workplaces. However, they were not adequately supported and maintained in southern Italy, and there was a lack of central coordination.

Review of Italian Epidemiologic Studies on Occupational Cancer Risk

Cohort and Case–Control Studies

In this section, we present a systematic review of Italian studies on the association between cancer and agents or activities in the workplace. These studies appeared in peer-reviewed journals between 1975 and 1994. They were traced by a search through MEDLINE and CANCERLIST. Case–series and descriptive epidemiologic studies are excluded from this review. However, the results of several descriptive studies on mesotheliomas will be discussed because they are directly relevant to occupational cancer risks.

Most epidemiologic studies on occupational cancer risks were conducted from 1975 to 1994 because the discipline emerged in Italy after the mid-1970s. This review presents estimates of attributable risk among the exposed (AR_e) and the general population (AR_p).

A number of cohort studies (Tables 2–4) (*10–78*) and case–control studies (Table 5) (*79–122*) have been published. These two types of studies share several characteristics: the populations studied were primarily in northern and central Italy, the studies were often conducted in cooperation with the occupational health units of the National Health Service; the studies tended to be small (33% of cohort studies were based on less than 20,000 person-years of follow-up).

The cohort studies (Table 2) began earlier and are more numerous than the case-control studies. Because employee records are kept in factories, cohort studies are feasible and can attain a satisfactory level of completeness and accuracy, with municipalities cooperating in providing the vital status of subjects and, where appropriate, the cause of death. However, inadequate exposure data impaired exposure assessment (only 36% of cohort studies had hygiene data collected at the factories under investigation). Rarely has a cohort study been conducted in a large factory or in a number of factories exposed to the same risk. The notable exceptions are those conducted in cooperation with the International Agency for Research on Cancer on vinyl chloride producers and on workers exposed to styrene in reinforced plastic manufacturing plants. Often the agents under study were those for which the evidence of carcinogenicity in humans was already defined. Most studies were of male subjects.

Cohort studies often detected elevated risks for all cancer mortality—up to relative risk (RR) of 2.7—because of high risks of tumors of the respiratory tract (RR values from 1.5 to 6.9 for lung cancer; from 5.6 to 150 for primary pleural cancer; from 1.8 to 4.5 for cancer of the larynx). The highest RR values were detected for primary pleural cancer among workers exposed to asbestos and for cancer of the bladder (RR values up to 30.6) among dyestuff producers (Table 3). These risk estimates suggest that the intensity of occupational exposure to some carcinogenic agents has been very high in the past.

In cohort studies that use the general population as a reference, lack of data about patterns of exposure to risk factors and confounding factors in the general population can lead to spurious estimates of attributable risk (AR).

Cohort studies can be used, however, to compute estimates of AR among the exposed (AR_e: RR –1/RR × 100) (Table 4). It is not surprising, considering that only studies with significantly increased RR values are reported in Table 3, that high AR_e were derived. An AR_e of approximately 100% for pleural cancer was found among those exposed to asbestos and for bladder tumors among those exposed to dyestuffs. AR_e values ranging from 33 to 8% for lung cancer and 23 to 58% for all cancers were observed among those exposed to asbestos, silica, and polycyclic aromatic hydrocarbons (PAHs).

For case–control studies, we report AR values. Occasionally, we estimated the AR percentage in the population (AR_p) from case–control studies on the basis of the following formula: AR% = (OR –1)/OR × Pe, where OR is the age-adjusted odds ratio and Pe is the proportion of exposed cases. This is the only approach that was feasible because direct access to the data was not possible.

Among the Italian case–control studies, a few produced estimates of AR values for nasal cancer from wood and leather dust exposures and for pleural cancer from asbestos exposure. A more substantial number of case–control studies of lung cancer have been specifically aimed at computing AR values from occupational exposures (Table 5). For unbiased estimates, the studies on lung cancer were based on population, and the probability and intensity of exposure was evaluated by hygienists from working histories derived from face-to-face interviews. These studies, carried out in northern Italy from 1983 to 1992, investigated the incidence or mortality in the male population from 1976 to 1986. We made no attempt to combine the results of these studies, even though this might have been useful (*123*). In the general male population (the study base), the AR_p for lung cancer from occupational agents evaluated as carcinogenic to humans varied from 12 to 39%. Estimates increased to AR_p 25.5 to 48.1% when exposure to agents "probably" carcinogenic to humans were included. Occupational exposure to asbestos explains the largest percentage of AR_p in two studies (20% of lung cancer in the male population in the dockyard town of Trieste in northern Italy; 50% of respiratory cancer in the male population of a restricted area of northern Italy where most of the work force of a factory was recruited) (*102,111,112*). Among those exposed, the AR values varied from 31 to 84% for occupational exposure to agents that have been proven to be carcinogenic.

Exposure to leather dust resulted in a very high AR_p (92%) for nasal cavity cancers in a population-based case–control study performed in an area where shoe manufacturing was the dominant industry (*90*). An AR_e up to 80% was reported among subjects occupationally exposed to both leather and wood dust in a hospital-based study involving several areas where employment was predominantly in shoe and furniture production (*114*).

Only one population-based case–control study on bladder cancer has been done in Italy to date, although there have been several hospital-based studies. The population-based study was carried out in an industrialized area near Genoa. No estimate has been made of AR_p due to exposures to risk factors of industrial origin; however, significant excesses due to dyestuff production and PAHs have been observed (*99*).

A limitation of ARs is that they are time- and place-specific, i.e., they express exposure circumstances of the location and the time in which each study was conducted. If studies are conducted in areas with a high prevalence of high-risk occupations, the estimates could overestimate the risks among other populations or at the national level. However, as previously mentioned several areas of Italy are highly specialized in similar productions, and estimates derived in any of these areas should be reasonably expended in others.

Record-Linkage Studies

In recent years, some surveys on mortality alone have linked occupation or most recent job (as recorded in census findings) with mortality (as recorded on death

Table 2. Cohort studies on occupational cancer risks performed in Italy from 1974 to 1994, main characteristics (listed by year of publication).

First author (reference)	Industrial factor studied	Activity/ risk	Year production started	Observation period	p-y	No. of subjects (if p-y not provided)	% of subjects lost to follow-up	Hygiene data
Rubino (*10*)	Talc mine	Talc	1921	1921–1950	2,000		10	1948
Puntoni (*11*)	Dockyard	Asbestos		1960–1970	35,000		0	
Rubino (*12,13*)[a]	Chrysotile mine		1916	1946–1987	27,000		2	1969
Bertazzi (*14*)	Printing		1900	1955	12,000		3.3	
Arduini (*15*)	Textile dyeing						5	
Giovanazzi (*16*)	Aluminium		1929	1965–1979	5,300			
Bertazzi (*17*)	Paints and varnishes			1946–1978	5,800			1978
Rubino (*9*)	Dyestuff		1922	1922–1970	16,000		4.2	1970
Sarto (*18*)	Cement–asbestos	Asbestos	1961	1961–1980	1,000		1.5	1977
Franchini (*19*)	Chromeplating			1951–1981	2,000		3	1980
Bertazzi (*20*)	Glass fibers		1944	1944–1974	19,000		2.1	1977
Puntoni (*21*)	Tannery		1962	1960–1979	18,000		2	
Cammarano (*22*)	Electric power		1928	1960–1969		270		
Decarli (*23*)	Dyestuff		1922	1922–1970	16,000		4.2	
Bonassi (*24*)	Different dockyards	Asbestos		1970–1981	54,000		0.1	
Magnani (*25*)	Train repair	Asbestos	1946	1967–1983	16,000		0.4	1978
Bertazzi (*26,27*)[a]	Resins		1959	1959–1980	27,000		1.4	1974
Zambon (*28*)	Silicotics	Silica		1959–1963	23,500			
Bernardinelli (*29*)	Rubber production		1962	1962–1982	69,000		0.1	
Belli (*30–32*)[a]	Vinyl chloride		1950	1953–1984	11,000		0	
Cordioli (*33*)	Glass		1945	1953–1967	11,000		1.7	
Forestiere (*34*)	Soap		1938	1969–1983	5,000		4	1974
Magnani (*35–37*)[a]	Cement–asbestos	Asbestos	1907	1950–1986	70,000		1.0	1971
Bertazzi (*38,39*)[a]	Capacitors	PCBs	1946	1946–1982	44,000		1.0	1954
Puntoni (*40*)	Brick	Silica	1931	1960–1986	4,000		0	1973
De Marco (*41*)	Chromate production		1920	1948–1985	7,500		0.6	1974
Battista (*42*)	Pyrite mine	Radon	1936	1965–1983	29,500		2	1970
Bertazzi (*43*)	Oil refinery			1948–1962	29,000		1.2	
Petrelli (*44*)	Electric power		1960	1968–1980	12,500			
Seniori (*45*)	Tanneries			1950–1983	44,000		0.,1	
Vai (*46*)	Benzene intoxicated			1951–1970				
Costa (*47*)	Aircraft prod		1900	1954–1981	132,000		0.8	
Forestiere (*48*)	Silicotics	Silica		1946–1984		595	0.9	
Corrao (*49*)	Pesticide users			1970–1974		25,945		
Paci (*50*)	Shoe/benzene		<1945	1950–1984		M 1,008 F 1,005	11	
Magnani (*51*)	Train repair	Asbestos		1967–1980	33,500		0	
Negri (*52*)	Rubber		1906	1946–1981	133,000		9	
Merlo (*53*)	Refractory/silica		1931	1954–1977	17,500		4.6	1973
Blasetti (*54*)	Train repair	Asbestos	1950	1968		276	2.9	
Piolatto (*55*)	Dyestuff production		1922	1922–1970	14,500		1	
Carta (*56*)	Silicotics	Silica		1964–1970	11,000		1.4	
Alberghini (*57*)	Agriculture	Pesticide		1974–1979	61,500		0.1	
Belli (*58*)	Laboratory		1930	1960–1989	39,000		0.6	
Rapiti (*59*)	Seamen			1936–1975	47,500		9	
Figa'-Talamanca (*60*)	Pesticides users			1946–1987	4,000		3	
Figa'-Talamanca (*61*)	Pesticides users			1973–1979	27,000			
Franco (*62*)	Coke oven plant	PAH	1943	1960–1985	10,500		1.9	
Menegozzo (*63*)	Train repair	Asbestos	1946	1970–1989		1,534	2.7	
Bisanti (*64*)	Ethylene oxide			1940–1982	20,000		0.8	
Cocco (*65*)	Lead, zinc mines	Silica		1932–1971	15,000		4	>1960
Cocco (*66*)	Metal miners	Silica		1932–1971	119,000		0.5	>1960
Carta (*67*)	Lead, zinc mines			1973		1,741	0	>1960
Zambon (*68*)	Viscosa rayon	CS_2	1918	1951–1979		166	2.7	1952
Torchio (*69*)	Pesticides users			1970–1986	341,000		0.8	
Tarchi (*70*)	Rock salt	Asbestos		1965–1989		487	0	
Borgia (*71*)	Taxi drivers			1950–1975	41,000		3.2	
Pettinari (*72*)	Cement–asbestos		1948	1948–1984			0.5	>1979
Petrelli (*73*)	Electric power plants			1968–1984	22,000		3.8	
Merler (*74*)	Fur hats	Mercury		1946–1983	31,000		1	
Giaroli (*75*)	Cement–asbestos		1952	1952–1987		3,341	2	>1975
Gennaro (*76*)	Oil refineries		1914	1950–1991	58,000		Up to 7%	
Forastiere (*77*)	Urban policemen			1973–1991	66,500		1.7	>1987
Merlo (*78*)	Silicotics	Silica		1961–1980		6,214		

Abbreviations: p-y, person-years; M, male; F, female. [a]Updated follow-up of the same cohort added to the first referenced study. [b]Females also included.

Table 3. Main results of cohort studies on occupational cancer risks performed in Italy from 1974 to 1994.[a]

Reference	Industrial sector	Sex[b]	All cancer, RR	Lung tumors	Primary pleural cancer	Gastrointestinal cancer	Bladder cancer	Larynx cancer	Hematologic cancer	Skin cancer
(11)	Dockyard/asbestos		1.4 [1.3–1.6]	2.2 [1.9–2.7]	Not given	1.8 [1.2–2.6]	Includes kidney 2 [1.3–3.2]	2 [1.1–3.2]		
(14)	Printing packers		1.8 (1.1–2.8)							
(15)	Textile dyeing		[5.68 (1.8–13.25)]							
(16)	Aluminium potroom/PAHs		1.8 [1–3]							
(9)	Dyestuff		2.7 [2.2–3.3]	1.8 [1–3]		Esophagus 4.7 [1.5–11]	29.3 [20.5–40.5]	3.6 [1.2–8.3]		
(18)	Cement–asbestos/asbestos		2.3 (1–4.3)	5.4 (2.2–11.1)						
(19)	Hard chromium platers		2.7 [1.4–4.5]	4.6 [1.7–10]						
(20)	Glass fibers		1.5 (1.1–2.1)					4.1 (1.3–9.9)		
(22)	Electric power/asbestos			2 (1.1–3.3)						
(24)	Dockyards/asbestos		1.3 (1.1–1.5)	1.7 (1.3–2.1)						
(26,27)	Resins			1.6 (1–2.3)		Liver 3.1 (1.1–7.3)				
(28)	Silicotics		1.4 (1.2–1.6)	2.4 (1.9–3)						
(33)	Glass/asbestos, PAHs			2.1 [1.1–3.6]				4.5 [1.2–11.4]		
(35–37)[c]	Cement–asbestos	M	1.7 (1.5–2)	2.7 (2.2–3.3)	26.1 (17.3–37.7)	Peritoneum 1.8 (1.2–2.6)				
		F	2.4 (1.9–3)	4.0 (1.6–8.2)	150 [84–247.4]					
(38)	Capacitors		2.5 (1.4–4.3)			3.5 [1.3–7.7]				
(40)	Brick	M	1.3 (1–1.6)	1.5 (1–2.2)			2.8 (1.1–5.7)	6.8 (4.5–10)		
(41)	Chromate production		1.5 (1.1–2.1)	2.2 (1.2–3.6)	30 (6.2–87.7)					
(43)	Oil refinery; moving dept		1.9 (1.2–2.8)	3.1 (1.5–5.5)						
(46)	Benzene intoxicated		2.2 (1.3–3.7)						13.3 (8–22.2)	
(47)	Aircraft				6 cases					Melanoma 5.6 (1.7–11.9)
(48)	Silicotics			1.5 (1.1–1.9)						
(49)[e]	Pesticides								Lymphomas 1.4 (1.1–1.9) 4 (1.5–8.7)	1.4 (1–1.8)
(50)	Shoes		1.4 (1.1–1.8)							
(52)	Rubber				11 (5.2–20.9)		1.8 (1–3)			
(53)	Silica		1.2 (1–1.6)	1.5 (1–2.2)			2.8 (1.1–5.7)			
(54)	Train repair				2 (1–32.5)					
(55)	Dyestuffs						30.6 [22.7–40.5]	2.7 [1–6]		
(59)	Seamen			1.7 (1.1–2.5)	5.9 (1.2–17.2)					
(61)	Pesticides					Liver 5.7 (1.5–14.6)				
(62)	Coke ovens			1.9 (1.1–3)						
(63)[e]	Train repair		1.3 (1–1.5)	1.5 (1–2)	4.7 (1.3–12.2)	Peritoneum 7.5 (1.3–23.5)				
(64)	Ethylene oxide								Lymphosarcoma 6.8 (1.9–17.5)	
(65)	Metal miners mine, A					Peritoneum 9.2 (2.5–23.5)				
(72)	Cement–asbestos		1.4 (1.1–2)	2.8 (1.8–4.2)						
(74)	Fur hats Mercury intoxicated	M	2.1 (1.3–3.3)			Stomach 1.8 (1.1–3)				
		F				2.1 (1.3–2.1)				
(75)	Cement–asbestos				6 (2.4–12.7)					
(76)	Oil refinery				16.3 (8–30.6)					
(78)	Silicotics		1.6 (1.3–2.2)	3.5 (2.4–4.9)						

Abbreviations: RR = SMR and 95% confidence intervals (in square brackets if computed by us). AR_e% = RR –1/RR; as computed by the authors. [a]Included are the cohort studies resulting in increased and statistically significant SMR values for cancer. [b]Male if not specified. [c]Incidence study. [d]Clocal rates used as reference. [e]Results as in Botta et al. (36), and based on national rates for comparison.

Table 4. Attributable risks among the exposed in cohort studies showing statistically significant excesses for selected target organs.

Reference	Agent	Industrial sector	Sex[a]	Types of cancer: All	Lung	Primary pleural	Gastrointestinal	Bladder
(11)	Asbestos	Dockyard		28.6	54.5	Not given	44.4	
(18)	Asbestos	Cement–asbestos		56.5	81.5			
(22)	Asbestos	Electric power			50			
(24)	Asbestos	Dockyards		23	37.5			
(35–37)	Asbestos	Cement–asbestos					Peritoneum	
			M	41.2	63	96.2	44.4	
			F	58.3	75	99.3		
(54)	Asbestos	Train repair				50		
(59)	Asbestos	Seamen			41.1	83		
(63)	Asbestos	Train repair		23.1	33.3	78.7	Peritoneum 86.7	
(72)	Asbestos	Cement–asbestos		28.6	64.3			
(75)	Asbestos	Cement–asbestos				83		
(76)	Asbestos	Oil refinery				93.9		
(9)	Dyestuffs	Dyestuffs		63	44.4			96.6
(15)	Dyestuffs	Textile dyeing		82.4				
(55)	Dyestuffs	Dyestuffs						96.7
(19)	Hard chromium platers			62.3	78.2			
(26,27)	PCBs	Resins			37.5		Liver 67.7	
(28)	Silica	Silicotics		28.6	58.3			
(40)	Silica	Brick	M	23.1	33.3			64.2
(48)	Silica	Silicotics			33.3			
(53)	Silica	Silicotics		16.7	33.3			64.2
(78)	Silica	Silicotics		37.5	71.4			
(16)	PAHs	Aluminium potroom		44.4				
(33)	Asbestos, PAHs	Glass			52.3			
(62V	PAHs	Coke oven			47.4			
(38,39)		Capacitors		60			71.4	
(41)	Chromium, asbestos	Chromate production		33.3	54.5	96.7		
(43)		Oil refinery; moving dept		47.4	67.7			
(46)	Benzene	Compensated subjects		54.5				
(50,52)	Benzene	Shoe rubber		28.6	90.9	44.4		
(61)	Pesticides	Pesticides users				Liver	82.5	
(74)	Inorganic mercury	Compensated Fur hat makers	M F	52.4				

Abbreviations: M, male; F, female. [a]Male if not specified.

certificates) among subjects economically active at the time of the census. In one of these studies, deaths that occurred from November 1981 to April 1982 in Italy among approximately 13 million residents 18 to 64 years of age at the time of the 1981 census were analyzed using a case–control approach (*124*). In another study, 435,609 residents of Turin 18 to 64 years of age, as listed in the 1981 census records, were followed until 1989 (*125*).

The national study had a significant percentage of unlinked subjects (16%), and its results may be distorted by a selection bias due to the short follow-up time and its proximity to the census. Cause-specific RR values by occupation were estimated as sex- and age-adjusted Mantel-Haenzel odds ratios (all causes of death except the one of interest included in the referent series; all occupations other than the one of interest classified as nonexposed). In the Turin study, sex-, age-, and cause-specific standard mortality ratios (SMRs) were computed using the rates of the whole population under study to obtain expected deaths. Subjects who migrated from the area after the census were not followed up (15.4%).

The studies provided information on 12 occupational categories including farming, mining, and the chemical, metal, textile, leather and shoe, rubber, and plastics and 44 specific causes of death including several cancer sites, myocardial infarction, respiratory diseases, cirrhosis, accidents. Separate studies have been done on women (*126*) and farmers (*127*).

Manual workers were shown to have a significantly higher relative risk of mortality than nonmanual workers (*125*). Increased RR values for several cancer sites were observed in several occupations: lung cancer in metal, iron and steel, and transport workers; and liver cancer in rubber-, chemical-, and trade-sector workers.

A summary AR_p of all the statistically significant excesses of lung cancer that could be attributed to occupational differences was attained by calculating the number of excess deaths for each profession showing an RR greater than 1 ($p <$ 0.01 and more than five deaths observed) and the proportion of such excess deaths in respect to all observed deaths. These AR values were not derived from either estimates of exposures to predefined chemicals or agents or from the entire working history of each subject. The higher value from lung cancer observed in the Italian population (AR_p, 6%) compared to the value observed in the population of Turin (AR_p, 4%) is surprising because Turin is a highly industrialized area. However, considering the follow-up period in the national study, this might indicate a greater intensity in earlier exposures. Despite the limitations of these studies, the results confirm that a significant percentage of lung tumors have resulted from occupational exposures, even in recent times.

Table 5. Results of case–control studies on occupational cancer risks carried out in Italy (1975–1994), main characteristics (listed by year of publication).

First author (reference)	Type of study	No. cases/sex	Site of cancer	Risk factors studied	RR, 95% CI	AR, exposed	AR, population
Berrino (*79*)	Population based	81	Lung	List A ,IARC	3 (1.4–6.6)	67	26.4
Cecchi (*80*)	Hospital based	69	Nose	Wood, leather	∞		
Musicco (*81*)	Hospital based	51	Brain, gliomas	Agriculture	5.0		
Battista (*82*)	Hospital based	36	Nose	Wood dust	5.4 (1.7–17.2)		
			Adenocarcinoma	Leather dust	89.7 (19.8–407.3)		
Riboli (*83*)	Population based	43	Lung	Phthalic anhydride	5.6 (1.6–19.)	82.1	17.2
				List A, IARC	1.7 (0.9–3.5)	31.4	16.6
Pastorino (*84*)	Population based	204	Lung	List A, IARC	2.1	51.4	33
				Lists A, B, IARC			41.7
Dardanoni (*85*)	Hospital based	53	Lip	Occupation			
				Greenhouse	12		
Buiatti (*86*)	Hospital based	376	Lung	Occupations			1.3
			M, F0	M: bricks,	6.5 (2.1–20.9)		
				taxi drivers	1.8 (1–3.4)		
				F: garment	3.5 (1.2–10.5)		
Aurora (*87*)	Population based	75	Larynx	Lists A, B, IARC	2.1 (0.5–5.1)		25
Vineis (*88*)	Hospital based	512	Bladder	Occupation			
				Leather	3.8 (1.3–115)		10
Magnani (*89*)	Nested	18	Respiratory	Asbestos	8.0 (1.5–43.5)		
Merler (*90*)	Population based	21	Nose	Leather	42.1 (8.7–255.1)		92
Forastiere (*91*)	Population based	72	Lung	Ceramic	2.0 (1.1–3.5)		
				Silicotics	3.9 (1.8–8.3)		
Vineis (*92*)	Population based	68	Sarcomas	Phenoxy herbicides	2.7 (0.6–12.5)		
		M, F					
Paci (*93*)	Hospital based	13	Pleura	Textile			
Paci (*94*)	Hospital based	441	Lung	Textiles	1.5 (1–2.7)		
Paci (*95*)	Hospital based	21	Pleura	Textiles	28 (4.8–164.7)		
Mastrangelo (*96*)	Hospital based	309	Lung	Silicotics	1.9 (1.1–3.2)		
Puntoni (*97*)	Hospital based	127	Bladder	Aromatic ammines	1.7		
Musicco (*98*)	Hospital based	240	Brain	Agriculture	1.6 (1.1–2.4)		
Bimbi (*99*)	Hospital based	53	Nose	Wood	∞		
					1.7		
Ciccone (*100*)	Population based	58	Lung	List A, IARC	4.1 (1.8–9.6)		37.9
				Lists A, B, IARC	4.4 (2–10.1)		48.1
Ronco (*101*)	Population based	126	Lung	List A, IARC	2.3 (0.9–5.3)		12
				Lists A, B, IARC	2.3 (1.1–4.4)		36
Parolari (*102*)	Population based	61	Respiratory	Amosite	6.2 (2.6–21.5)	83.7	52.9
Loi (*103*)	Hospital based	38	Nose	Wood	8.1 (2–33.5)		
				Leather	9.7 (3.2–29.4)		
Donna (*104*)	Population based	43	Ovary	Herbicides	2.7 (1–6.9)		
Bonassi (*105*)	Population based	121	Bladder	Dyestuff products	3.6 (1.6–8.1)		
				PAH	2.3 (1.2–4.5)		
La Vecchia (*106*)	Hospital based	263	Bladder	Occupation	90% CI		
				Dyestuffs	5.2 (1.1–24.9)		
Pasqualetti (*107*)	Hospital based	170	Myeloma	Occupations			
			M, F	Agricultural work	2.7 (1.9–4.4)[a]		
				Industry	3.2 (2–5.8)[a]		
				Asbestos	4 (2–8.1)[a]		
				Mineral oils	3 (2–51.)[a]		
				Pesticides	2.8 (1.9–4.8)[a]		
Merletti (*108*)	Population based	86	Oropharynx	Occupations			
				Cooks	10.3 (1.3–81.3)		
				Food production	8.3 (1.4–55)		
				Tailors	6.8 (1.4–38.7)		
				Plumbers	5.0 (1.8–21.5)		
Pasqualetti (*109*)	Hospital based	620	Hematologic	Occupations			
		M, F	Maligancies	Industry	3 (2–4.5)[a]		
				Farmers	2.7 (1.9–3.9)[a]		
Becherini (*110*)	Hospital based	199	Bladder	Textile	1.4 (1–2)		
				Rag sorters	4.1 (1.4–12)		
Bovenzi (*111,112*)	Population based	756	Lung	List A ,IARC	2.3 (1.7–3.1)	55.5	16.2
				List B, IARC	1.3 (1–1.7)	24.8	9.3
				List A, B, IARC	1.6 (1.3–2)	38.3	25.5
				Asbestos	2 (1.4–2.8)	14.1	20
Comba (*113*)	Hospital based	23	Nose	Occupations			
				Textile	17 (1.9–162)		

(Continued)

Table 5. *Continued.*

First author (reference)	Type of study	No. cases/sex	Site	Risk factors studied	RR, 95% CI	AR, exposed	AR, population
Comba (*114*)	Hospital based	78	Nose	Wood dust	5.8 (2.2–15)	83	21
				Leather dust	6.8 (1.9–25)	85	8
			Adenocarcinoma	Wood dust	13.9 (3.1–62)		
				Leather dust	14.1 (2.6–76)		
Forastiere (*115*)	Population based	1579	17 sites	Agriculture			
				Pesticide users			
				Stomach	2.6 (1.1–6.3)[a]		
				Pancreas	3.8 (1.2–11)[a]		
Franceschi (*116*)	Hospital based	2333	14 sites	Farming			
				Oral cavity	1.8 (1.3–2.4)		
Magnani (*117*)	Population based	33	Nose	Wood dust	4.4 (1.4–13.4)[a]		
			Adenocarcinoma	Wood dust	22 (4.4–122)[a]		
Cocco (*118*)	Hospital based	567	Lung	Occupations			
				Miners	1.8 (1.3–26)		
				Farmers	1.4 (1.1–1.9)		
Ciccone (*119*)	Hospital based	50	Acute myeloid leukemias				
		17	Chronic myeloid leukemias	Pesticides, F	4.4 (1.7–11.5)		
		19	Myelodysplastic syndrome				
Zappa (*120*)	Population based	207	Lung	Textile	1.5 (1–2.1)		
				Rag sorters	2.2 (1.3–3.8)		
Cocco (*121*)	Population based	640	Gastric	Occupations			
				Seamen	2.9 (1.1–8)[a]		
Barbone (*122*)	Hospital based	236	Bladder	Occupations			
				Chemical industry	3.1 (1.2–8.5)		
				Dyestuff	6.9 (0.6–86)		

Abbreviations: RR, relative risk; AR, attributable risk. [a]Adjusted for smoking, if not otherwise specified.

Mesothelioma Due to Asbestos in Italy

The mining of asbestos in Italy began in 1870. The Balangero mine in the northern Italian Alps was a rich source of chrysotile, and this availability encouraged Italian consumption of raw asbestos. Both amosite and crocidolite have been extensively used in Italy. For example, amosite was used in pipe insulation and in shipyards as insulation applied in spray form; crocidolite (which was not banned until 1986) was used as insulation for railway carriages and was also applied in spray form. The consumption of raw asbestos increased sharply after the 1950s, when it became comparable to that of the United Kingdom and France. However, it was not until the 1970s that the intensity of exposure to asbestos in workplaces began to be controlled.

The cancer registries of Genoa and Trieste are now recording the world's highest incidence rates of mesothelioma (pleural and peritoneal combined) among males: 5 ± 0.4 and 6.36 ± 0.85 age-standard rate × 100,000 (world population as standard), respectively (*128*). High incident rates of mesothelioma have also been observed in the female populations of both cities (0.92 ± 0.17 and 0.56 ± 0.25, respectively); that of Genoa's female population is the highest worldwide. Because women do not work in shipyards of either city, environmental exposures would appear to be the most plausible explanation for this high incidence of mesothelioma (*128*).

High rates of mortality from primary pleural tumors were observed in several shipyard areas of Italy: Trieste, Genoa, Gorizia, Venice, La Spezia, Taranto, Leghorn, and Naples. They were also observed in areas of Piedmont and Lombardy where asbestos has been used in textile production, automobile brakes, and in asbestos cement manufacture (*129*). A positive correlation was observed between areas with high mortality rates from pleural and peritoneal tumors (*130*) and areas in which numerous compensations have been awarded (*131*).

The high rates of mesothelioma detected in descriptive epidemiologic studies have been investigated and explained as being the result of high risks among shipyard, asbestos cement manufacturers, and textile asbestos workers (*11,132–135*).

Attempts to Estimate the Number of Workers Exposed to Carcinogens and the Intensity of Their Exposures

Systematic data on the number of workers exposed to carcinogens are not available in italy. Estimates have been made in the context of population-based case–control studies (Table 4). These studies, however, have been conducted for the most part in northern Italy, and the data they provide are rather heterogeneous because of the various methods of exposure assessment used. It is difficult, therefore, to judge whether results of these studies reflect genuine differences or merely differences of approach.

To overcome this difficulty, we have chosen three recent studies in which study designs were similar (population-based case–control studies, with control groups that are random samples of the general population) (*112,136*) and whose common methodology led to a particular accuracy in the assessment of exposure. We have reconsidered the original data of these studies, one of which was on cancer of the larynx, one on hematolymphopoietic malignancies, and one on lung cancer. The study on cancer of the larynx used the work histories since 1944 of 799 randomly selected male controls residing in the heavily industrialized areas of Turin and Varese. The study on hematolymphopoietic malignancies analyzed the lifetime occupations of 1,386 controls (731 men and 655 women) from nine areas of Italy. The study on lung cancer analyzed the lifetime work histories of 755 male controls from Trieste. Information about risk factors was collected through person-to-person interviews. In all three studies, job titles and economic activities were coded with the 5-digit International Standard Classification of Occupations (*137*) and/or the 4-digit International Standard Classification of all Economic Activities (*138,139*). A team of industrial hygienists (or agronomists, in the case of the first study) assessed the probability of a person being exposed to various agents on an ordinal scale (i.e., unexposed, possibly exposed, certainly exposed, certainly exposed at high levels).

There has been a historical development in the methods for exposure assessment in the context of population-based studies. The study of hematolymphopoietic malignancies, in particular, reflects this development, which consisted of *a*) the use of job-specific forms (in addition to the general occupational history) in occupational interviews, and *b*) the standardization of exposure assessment procedures by experts, including the evaluation of inter-rate agreement (*136*).

We used only a fraction of the information available in these studies for our estimates. In our preliminary analysis of the study of hematolymphopoietic malignancies, for example, we only considered the frequency of having been certainly exposed. More detailed information on intensity and probability will be forthcoming in future studies.

In the study of cancer of the larynx, 7.8% of subjects were certainly exposed to asbestos in their work histories. This is because the study was carried out in heavily industrialized areas. Exposure began around 1944 and was mainly in the metal products industry.

In the study of hematolymphopoietic malignancies, 35 men (4.8%) and 6 women (1%) were certainly exposed to asbestos. Since about 1954, the construction industry was the employment sector in which more frequently exposure occurred; 26 men (3.5%) and 4 women (0.6%) were certainly exposed to benzene. Among the men, most of these exposures occurred before 1964 (when the law was changed), and only four exposures began after that date (three in construction and one in the metal industry).

The lung cancer study in Trieste assessed the cancer risk from exposure to asbestos (used in shipbuilding, Trieste's largest single industry) and PAHs (used mainly in steel foundries and metal working, both of which are also large employers in the area). Ninety-four of the 755 controls (12%) were certainly exposed to asbestos and 36 (3.4%) were certainly exposed to PAHs.

These three studies have limitations: they considered only a few carcinogens, they studied a relatively small number of subjects, and the areas where they were conducted were not selected to be representative of the general Italian population. It is possible nevertheless to make some comments on asbestos exposure in Italy in the light of the results of these studies.

The proportion of controls exposed to asbestos varies between 12% in an area dominated by a single industry (shipbuilding) and 4.8% in the combined results from nine areas with different levels of industrialization (including areas in central and southern Italy). The intermediate value of 7.8% in Varese and Turin makes sense, when considering the previously mentioned extremes. Furthermore, the results suggest that the construction industry is the source of workers' more recent exposure to asbestos.

Compensation for Occupational Cancer

Italy has had a system for compensation for injuries in the workplace since 1898 and for occupational diseases since 1934. This system is based on the principle that the workplace can be hazardous and employees must, therefore, be insured under a national insurance program at the employer's expense, the cost to be determined by the extent of the estimated risk. If a worker has an accident or contracts an occupational disease, the cost of treatment will be reimbursed to the National Health System by the insurers. The worker will receive compensation if he is disabled to the extent that his original capacity to work is decreased by 11% or more; he is also compensated if his employer did not pay the insurance.

However, the system has always differentiated between compensation for accidents and compensation for diseases. The category of accidents at work is rather broad, including those *in itinere*, whereas diseases are more strictly defined as those caused by work. Furthermore, the percentage of disablement as a result of an accident is easier to calculate than that caused by disease.

Since 1988, Italy has had a mixed system for compensating for occupational diseases. A list has been compiled of occupational diseases and the right to compensation if a causal link is proven between an exposure and a disease (*140*). Items on the list fall into two distinct group—one in which the disease can vary but the etiologic agent is clearly defined (e.g., diseases caused by lead); and one in which both the disease and the agent are clearly defined (e.g., skin diseases caused by cement). A similar distinction is made among occupational cancers, for example, diseases caused by chromium (lung cancers among those exposed to hexavalent chromium could be included in this category) and mesothelioma caused by asbestos (in which both the cancer and the agent are specified).

The current list was introduced in 1994. It includes 58 categories for industrial and 27 for agricultural activities (*140*). A distinction is thus made between industrial and agricultural claims. Agricultural workers get less compensation; they have only been compensated for occupational diseases since 1958. This difference in compensation is only partly explained by genuine differences in exposure situations. The current list devotes far more space to occupational cancer than the previous list. It includes all occupational exposures recognized by the International Agency of Research on Cancer and the Italian National Toxicology Committee as having "sufficient evidence" of carcinogenicity.

Limitations of the Italian system of compensation for occupational cancer are the following: it is extremely rigid, it allows few workers actually to receive compensation, and it tends to discourage claims. We consider each of these problems individually.

The Italian system is rigid because it has shown little ability to evolve over time in response to new knowledge and conditions. The list of diseases for which one can be compensated has been revised only 6 times since its introduction in 1934. The 1994 list replaced a list on the books since 1975. Italian legislation does not require regular updating of the list, and there is no permanent independent committee of experts to suggest change whenever the need arises. Lack of consideration on new epidemiologic findings linking exposures and diseases has meant that new diseases are not added to the list when they should be. A striking example of this is mesothelioma due to occupational asbestos exposure:

mesothelioma, in the absence of asbestosis (which was listed), was not included in the list until 1994 (*141*). For decades before that, studies on mesothelioma in Italy clearly argued for the need to update the compensation system for cancer caused by asbestos.

Few Italian workers actually receive compensation for occupational cancer (Table 6) (*142*). Since 1988 when the mixed system was introduced, 53% of the 466 claims for cancer have been rejected by the insurer in charge of the largest number of industrial workers. Fortunately, the 1994 list could be applied to past claims still under scrutiny, so the number of awards has recently increased. Nevertheless, many claimants have been turned away. The long latency period of occupational diseases, the low profile that the National Health System gives to the link between diseases and occupational exposures, and the lack of an active search for occupational diseases and of proper registries for some of those already known all help explain the low number of requests for compensation.

Finally, the Italian system of compensation actually discourages claims. No effort is made to inform workers of their rights. Instead, the system maintains a passive attitude of replying to requests if there are any. If a claim is made, a worker cannot approach the system as an individual. The assistance of trade union institutes is usually needed to follow the overall process from claim to the final decision on compensation.

Table 6. Number of subjects (by cancer site) who were compensated from 1989 to 1994 in Italy.[a,b]

Tumor site or type	No. of cases	%
Lung	95	25.3
Bladder	79	21
Pleural mesothelioma	56	15
Nasal sinuses	195	
Skin carcinomas (excluding melanomas)	17	4.5
Larynx	13	3.5
Buccal cavity	12	3.2
Lip	10	2.7
Liver	10	2.7
Hematologic	10	2.7
Other respiratory	9	2.4
Peritoneal mesothelioma	4	1.1
Breast	4	1.1
Thigh	3	0.8
Melanomas	3	0.8
Prostate	2	0.5
Brain	2	0.5
Others	28	7.4
Total	376	

[a]Industrial workers only. [b]Data from National Institute for Compensation (INAIL) (*142*).

Finally, some working populations are dealing with special insurers. Recently, railway workers affected by mesotheliomas due to occupational exposures to asbestos reacted energetically against this state of affairs. When, even after 1994, all requests for compensation were denied, railway workers and their relatives went to court to overturn the rejections of their insurance claim.

Conclusions

The extent and severity of occupational cancer in Italy cannot be adequately described because of lack of information on the number of workers exposed to carcinogenic substances, the intensity of these exposures, and the variation over time. No inquiry has been made at the national level, and any such inquiry would encounter difficulties in finding, compiling, and interpreting information collected at the local level by the occupational health units of the National Health Service. The National Institute of Occupational Health has a low profile, and funding of projects on occupational cancer risks has been too modest.

Some epidemiologic research has been done nonetheless (Tables 2–5) to investigate causal associations between exposure and disease where an agent is suspected of being a carcinogenic risk or of quantifying the impact of exposures to known carcinogens. However, few of these studies investigated the same risk in various industries and few attained sufficient statistical power and/or a gradient in exposure intensities.

The largest Italian industries—producers of cars, chemicals and petrochemicals, pharmaceuticals, etc.—have not been the subject of epidemiologic studies on cancer risk because they did not wish to participate in such studies. Companies known to use carcinogens often avoid or impede epidemiologic studies because they do not appreciate the public health benefit and fear liability.

The planned extension of record-linkage studies may constitute an alternative way to obtain new epidemiologic data. Italy should follow the example of other countries that require firms upon liquidation to release their employee records to national institutes.

Italy needs to prioritize and maximize resources in occupational cancer epidemiology and to revitalize the role of national institutions. A national registry of mesotheliomas linked to asbestos exposure has recently been established on the suggestion of a European Directive. A national registry of cancer cases suspected to be of occupational origin has been recommended in the legislation on carcinogenic substances at work. If these projects are pursued, we can expect a positive effect on the prevention and diagnosis of and compensation for occupational cancers.

ACKNOWLEDGMENTS. We thank F. Berrino and F. Barbone for providing original data on their studies, J. Vena for helpful suggestions and comments, D. Barret for editing the manuscript.

E. Merler was at the Unit of Environmental Cancer, International Agency for Research on Cancer, Lyon, France, at the time this article was written.

REFERENCES AND NOTES

1. Castronovo V. L'Industria Italiana dall'Ottocento a Oggi. Milan:Mondadori, 1990.
2. Sistema Statistico Nazionale Istituto Nazionale di Statistica. Imprese Istituzioni e Unità Locali Fascicolo Nazionale, 6° Censimento Generale dell' Industria e dei Servizi. Rome:Istituto Poligrafico dello Stato, 1981.
3. Sistema Statistico Nazionale Istituto Nazionale di Statistica. Imprese Istituzioni e Unità Locali Fascicolo Nazionale, 7° Censimento Generale dell' Industria e dei Servizi. Rome:Istituto Poligrafico dello Stato, 1991.
4. Merler E, Biggeri A. Gli effetti a lungo termine di esposizioni esogene in malattie cronico-degenerative: l'esempio della mortalita' per silicosi in Italia. In: Egualianza in Sanita' in Italia (Costa G, Faggiano F, eds). Bologna:Franco Angeli, 1994;211–222.
5. Marconi A. Esposizione lavorativa all'asbesto in Italia: considerazioni sulla base dei dati disponibili. In: Il Rischio Neoplastico da Amianto nei Luoghi di Lavoro e nell'Ambiente di Vita (Parolari G, Gherson G, Cristofolini A, Merler E, eds). Verona:Bi & Gi, 1987;159–171.
6. Patroni M, Trimarchi R, Andreoletti F, Foa' V, Chiappino G. Occupational risk in the asbestos-cement industry. Med Lav 78:351–359 (1987).
7. Kogevinas M, Ferro G, Coggon D, Gennaro V, Hutchings S, Kolstad M, Lunberg I, Lynge E, Partanen T, Saracci R. Cancer mortality in an historical cohort study of workers exposed to styrene. Scand J Work Environ Health 20: 251–261 (1994).
8. Bellander T, Merler E, Ceccarelli F, Boffetta P. Historical exposure to inorganic mercury at the mine of Abbadia San Salvatore, Italy. Ann Occup Hyg 42:81–90 (1998).
9. Rubino GF, Scansetti G, Piolatto G, Pira E. The carcinogenic effect of aromatic amines: an epidemiological study on the role of *o*-toluidine and 4,4′-methylenebis(2-methylaniline) in inducing bladder cancer in man. Environ Res 27: 241–254 (1982).
10. Rubino GF, Scansetti G, Piolatto G, Romano CA. Mortality study of talc miners and millers. J Occup Med 18:187–193 (1976).
11. Puntoni R, Vercelli M, Merlo F, Valerio F, Santi L. Mortality among shipyard workers in Genoa, Italy. Ann NY Acad Sci 330:353–378 (1979).

12. Rubino GF, Piolatto G, Newhouse ML, Scansetti G, Aresini GA, Murray R. Mortality of chrysotile asbestos workers at the Balangero mine, northern Italy. Br J Ind Med 36:187–194 (1979).
13. Piolatto G, Negri E, La Vecchia C, Pira E, Decarli A, Peto J. An update of cancer mortality among chrysotile asbestos miners in Balangero, northern Italy. Br J Ind Med 47:810–814 (1990).
14. Bertazzi PA, Zocchetti C. A mortality study of newspaper printing workers. Am J Ind Med 1:85–97 (1980).
15. Arduini L, Pavanello E, Pianosi G, Porta P, Valioni V. Mortalita' tra gli utilizzatori di coloranti: valutazione di una serie omogenea in una tintoria di filati. Epidemiol Prev 14 42–44 (1981).
16. Giovanazzi A, D'Andrea F. Cause di morte fra i lavoratori di un impianto di riduzione elettrolitica di allumina. Med Lav 4:277–282 (1981).
17. Bertazzi PA, Zocchetti C, Terzaghi GF, Riboldi L, Guercilena S, Beretta F. Rischio cancerogeno nella produzione di vernici. Uno studio di mortalita'. Med Lav 6:465–472 (1981).
18. Sarto F, Zambon P, Mastrangelo G, Righetto F. Studio epidemiologico sulla mortalita' per tumori di una coorte di soggetti esposti ad amianto. Epidemiol Prev 17–18: 58–59 (1982).
19. Franchini I, Magnani F, Mutti A. Mortality experience among chromeplating workers. Scand J Work Environ Health 9:247–252 (1983).
20. Bertazzi PA, Zocchetti C, Pesatori A, Radice L, Riboldi L. Mortalita' per tumori in una coorte di produttori di fibre vetrose. Med Lav 75:339–358 (1984).
21. Puntoni R, Valerio A, Cresta E, Filiberti R, Bonassi S, Vercelli M. Studio di mortalita' fra i lavoratori di una conceria. Med Lav 75: 471–477 (1984).
22. Cammarano G, Crosignani P, Berrino F, Berra G. Cancer mortality among workers in a thermoelectric power plant. Scand J Work Environ Health 10: 259–261 (1984).
23. Decarli A, Peto J, Piolatto G, La Vecchia C. Bladder cancer mortality of workers exposed to aromatic amines: Analysis of models of carcinogenesis. Br J Cancer 51:707–712 (1985).
24. Bonassi S, Ceppi M, Puntoni R, Valerio F, Vercelli M, Belli S, Biocca M, Comba P, Tichiarelli L, Mariotti F, et al. Mortality studies of dockyard workers (longshoremen) in Italy. Am J Ind Med 7:219–227 (1985).
25. Magnani C, Nardini I, Governa M, Serio A. Uno studio di coorte degli addetti ad una Officina di Grandi Riparazioni (O.G.R.) delle Ferrovie dello Stato. Med Lav 77:154–161 (1986).
26. Bertazzi PA, Pesatori AC, Radice L, Zocchetti C, Vai T. Exposure to formaldehyde and cancer mortality in a cohort of workers producing resins. Scand J Work Environ Health 12:461–465 (1986).
27. Bertazzi PA, Pesatori A, Guarcilena S, Consonni D, Zocchetti C. Rischio cancerogeno per i produttori di resine esposti a formaldeide: estensione del follow-up. Med Lav 80:111–122 (1989).
28. Zambon P, Simonato L, Mastrangelo G, Winkelmann R, Saia B, Crepet M. Mortality of workers compensated for silicosis during the period 1959–1963 in the Veneto Region of Italy. Scand J Work Environ Health 13:118–123 (1987).
29. Bernardinelli L, De Marco R, Tinelli C. Cancer mortality in an Italian rubber factory. Br J Ind Med 44:187–191 (1987).
30. Belli S, Bertazzi PA, Comba P, Foa' V, Maltoni C, Masina A, Piratsu R, Reggiani A, Vigotti MA. A cohort study on vinyl chloride manufacturers in Italy: study design and preliminary results. Cancer Lett 35:253–261 (1987).
31. Piratsu R, Comba P, Reggiani A, Foa' V, Masina A, Maltoni C. Mortality from liver disease among Italian vinyl chloride monomer/polyvinyl chloride manufacturers. Am J Ind Med 17:155–161 (1990).
32. Piratsu R, Belli S, Bruno C, Comba P, De Santis M, Foa' V, Matoni C, Masina A, Reggiani A. La mortalita' dei produttori di cloruro di vinile in Italia. Med Lav 82:388–423 (1991).
33. Cordioli G, Cuoghi L, Solari PL, Berrino F, Crosignani P, Riboli E. Mortalita' per tumore in una coorte di lavoratori dell'industria del vetro. Epidemiol Prev 30:16–18 (1987).
34. Forastiere F, Valesini S, Salimei E, Magliola ME, Perucci CA. Respiratory cancer among soap production workers. Scand J Work Environ Health 13:258–260 (1987).
35. Magnani C, Terracini B, Bertolone GP, Castagneto B, Cocito V, De Giovanni D, Paglieri P, Botta M. Mortalita' per tumori e altre malattie del sistema respiratorio tra i lavoratori del cemento-amianto a Casale Monferrato. Uno studio di coorte storico. Med Lav 78:441–453 (1987).
36. Botta M, Magnani C, Terracini B, Bertolone GP, Castagneto B, Cocito V, De Giovanni D, Paglieri P. Mortality from respiratory and digestive cancers among asbestos cement workers in Italy. Cancer Detection Prev 15:445–447 (1991).
37. Magnani C, Terracini B, Ivaldi C, Mancini A, Botta M. Mortalita' per tumori e altre cause tra i lavoratori del cemento-amianto a Casale Monferrato. Med Lav 87:133–146 (1996).
38. Bertazzi PA, Riboldi L, Pesatori A, Radice L, Zocchetti C. Cancer mortality of capacitor manufacturing workers. Am J Ind Med 11:165–176 (1987).
39. Tironi A, Pesatori A, Consonni D, Zocchetti C, Bertazzi PA. Mortalita' dei lavoratori esposti a PCB. Epid Prev 20:200–202 (1996).
40. Puntoni R, Goldsmith DF, Valerio F, Vercelli M, Bonassi S, Di Giorgio F, Ceppi M, Stagnaro E, Filiberti R, Santi L, Merlo F. A cohort study of workers employed in a refractory brick plant. Tumori 74:27–33 (1988).
41. De Marco R, Bernardinelli L, Mangione MP. Rischio di morte per tumore dell'apparato respiratorio in lavoratori addetti alla produzione di cromati. Med Lav 79:368–376 (1988).
42. Battista G, Belli S, carboncini F, Comba P, Levante G, Sartorelli P, Strambi F, Valentini F, Axelson O. Mortality among pyrite miners with low-level exposure to radon daughters. Scand J Work Environ Health 14:280–285 (1988).
43. Bertazzi PA, Pesatori AC, Zocchetti C, Latoccca R. Mortality study of cancer risk among oil refinery workers. Int Arch Occup Environ Health 61:261–270 (1989).
44. Petrelli G, Minniti-Ippolito, Taroni F, Raschetti R, Magarotto G. A retrospective cohort mortality study on workers of two thermoelectric power plants: fourteen-years follow-up results. Eur J Epidemiol 5:87–89 (1989).
45. Seniori Costantini A, Paci E, Miligi L, Buiatti E, Martelli C, Lenzi S. Cancer mortality among workers in the Tuscan tanning industry. Br J Ind Med 46:384–388 (1989).
46. Vai T, Radice L, catenacci G, Biscardi GP, Guercilena S, Pesatori AC, Bertazzi PA. Studio a distanza di 304 casi di sospetta patologia da benzene osservati negli anni 1950–1971. Med Lav 80:397–404 (1989).
47. Costa G, Merletti F, Segnan N. A mortality cohort study in a north Italian aircraft factory. Br J Ind Med 46:738–743 (1989).
48. Forastiere F, Lagorio S, Michelozzi P, Perucci CA, Axelson O. Mortality pattern of silicotics in Latium region - Italy. Br J Ind Med 46:877–880 (1989).
49. Corrao G, Calleri M, Carle F, Russo R, Bosia S, Piccioni P. Cancer risk in a cohort of licensed pesticide users. Scand J Work Environ Health 15:203–209, 1989.
50. Paci E, Buiatti E, Seniori Costantini A, miligi L, Pucci N, Scarpelli A, Petrioli G, Simonato L, Winkelmann R, Kaldor JM. Aplastic anemia, leukemia and other cancer mortality in a cohort of shoe workers exposed to benzene. Scand J Work Environ Health 15:313–318 (1989).
51. Magnani C, Ricci P, Terracini B. A mortality historical cohort study in the Verona repair workshop of Italian Railways. Acta Oncologica 10:201–207 (1989).
52. Negri E, Piolatto G, Pira E, Decarli A, Kaldor J, La Vecchia C. Cancer mortality in a northern Italian cohort of rubber workers. Br J Ind Med 46:624–628 (1989).
53. Merlo F, Costantini M, Reggiardo G, Ceppi M, Puntoni R. Lung cancer risk among refractory brick workers exposed to crystalline silica: a retrospective cohort study. Epidemiology 2: 299–305 (1991).
54. Blasetti F, Bruno C, Comba P, Fantini F, Grignoli M. Studio di mortalita' relativo agli addetti alla costruzione di carrozze ferroviarie a Colleferro. Med Lav 81:407–413 (1990).
55. Piolatto G, Negri E, La Vecchia C, Pira E, Decarli A, Peto J. Bladder cancer mortality of workers exposed to aromatic amines: an updated analysis. Br J Cancer 63:457–459 (1991).
56. Carta P, Cocco PL, Casula D. Mortality from lung cancer among Sardinian patients with silicosis. Br J Ind Med 48:122–129 (1991).
57. Alberghini V, Luberto F, Gobba F, Morelli C, Gori E, Tomesani N. Mortality among male farmers licensed to use pesticides. Med Lav 82:18–24 (1991).
58. Belli S, Comba P, De Santis M, Grignoli M, Sasco A. Mortality study of workers employed by the Italian National Institute of Health, 1960–1989. Scand J Work Environ Health 18:64–67 (1992).
59. Rapiti E, Turi E, Forastiere F, Borgia P, Comba P, Perucci CA, Axelson O. A mortality cohort study of seamen in Italy. Am J Ind Med 21:863–872 (1992).
60. Figa'-Talamanca I, Mearelli I, Valente P. Mortality in a cohort of pesticide applicators in an urban setting. Int J Epidemiology 22:674–676 (1993).
61. Figa'-Talamanca I, Mearelli I, Valente P, Bascherini S. Cancer mortality in a cohort of rural licensed pesticide users in the Province of Rome. Int J Epidemiology 22:579–583 (1993).

62. Franco F, Chellini E, Seniori Costantini A, Goia A, Carra G, Paolinelli F, Martelli C, Vigotti M. Mortality in the coke oven plant of Carrara, Italy. Med Lav 84:443–447 (1993).
63. Menegozzo M, Belli S, Bruno C, Canfora V, Costigliola A, Di Cintio P, Di liello L, Grignoli M, Palumbo F, Sapio P, Comba P. La mortalita' per cause correlabili all'amianto in una coorte di addetti alla costruzione di carrozze ferroviarie. Med Lav 84:193–200 (1993).
64. Bisanti L, Maggini M, Raschetti R, Spila Alegiani S, Menniti Ippolito F, Caffari B, Segnan N, Ponti A. Cancer mortality in ethylene oxide workers. Br J Ind Med 50:317–324 (1993).
65. Cocco PL, Carta P, Flore V, Picchiri GF, Zucca C. Lung cancer mortality among female mine workers exposed to silica. J Occup Med 36:894–898 (1994).
66. Cocco PL, Carta P, Belli S, Picchiri GF, Flore MV. Mortality of Sardinian lead and zinc miners: 1960–88. Occup Environ Med 51:674–682 (1994).
67. Carta P, Cocco P, Picchiri G. Lung cancer mortality and airways obstruction among metal miners exposed to silica and low levels of radon daugthers. Am J Ind Med 25:489–506 (1994).
68. Zambon P, Corsi G, Bertin T, Camporese R, Simonato L. Studio epidemiologico di mortalita' in una coorte di addetti alla produzione di rayon viscosa. Med Lav 85:390–396 (1994).
69. Torchio P, Lepore AR, Corrao G, Comba P, Settimi L, Belli S, Magnani C, Di Orio F. Mortality study on a cohort of Italian licensed pesticide users. Sci Tot Environ 149:183–191 (1994).
70. Tarchi M, Orsi D, Comba P, De Santis M, Riratsu R, Battista G, Valiani M. Cohort mortality study of rock salt workers in Italy. Am J Ind Med 25:251–256 (1994).
71. Borgia P, Forastiere F, Rapiti E, Rizzelli R, Magliola ME, Perucci CA, Axelson O. Mortality among taxi drivers in Rome: a cohort study. Am J Ind Med 25:507–517 (1994)
72. Pettinari A, Mengucci R, Belli S, Comba P. Studio di mortalita' degli addetti alla produzione di manufatti in cemento-amianto nello stabilimento di Senigallia. Med Lav 85: 223–230 (1994).
73. Petrelli G, Minniti Ippolito F, Spila Alegiani S, Magarotto G, Taroni F. Mortality among workers of three thermoelectric power plants in Northern Italy: a retrospective cohort study. Med Lav 85: 397–401 (1994).
74. Merler E, Boffetta P, Masala G, Monechi V, Bani F. A cohort study of workers compensated for mercury intoxication following employment in the fur hat industry. J Occup Med 36: 1260–1264 (1994)
75. Giaroli C, Belli S, Bruno C, Candela S, Grignoli M, Minisci S., Poletti R, Ricco' G, Vecchi G, Venturi G, Ziccardi A, Comba P. Mortality study of asbestos cement workers. Int Arch Occup Environ Health 66:7–11 (1994).
76. Gennaro V, Ceppi M, Boffetta P, Fontana V, Perrotta A. Pleural mesothelioma and asbestos exposure among Italian oil refinery workers. Scand J Work Environ Health 20:213–215 (1994).
77. Forastiere F, Perucci CA, Di Pietro A, Miceli M, Rapiti E, Bargagli A, Borgia P. Mortality among urban policemen in Rome. Am J Ind Med 26:785–798 (1994).
78. Merlo F, Fontana L, Reggiardo G, Ceppi M, Barisone G, Garrone E, Doria M. Mortality among silicotics in Genoa, Italy, from 1961 to 1987. Scand J Work Envion Health 21(suppl 2):77–80 (1995).
79. Berrino F, Crosignani P, Pastorino U, Riboli E, Adami R, Gervasio A. Valutazione del rischio attribuibile alle esposizioni professionali. Epidemiol Prev 10/11:70–77 (1980).
80. Cecchi F, Buiatti E, Kriebel D, Nastasi L, Santucci M. Adenocarcinoma of the nose and paranasal sinuses in shoemakers and woodworkers in the province of Florence, Italy (1963–77). Br J Ind Med 37:222–225 (1980).
81. Musicco M, Filippini G, Bordo BM, Melotto A, Morello G, Berrino F. Gliomas and occupational exposure to carcinogens: case-control study. Am J Epidemiol 116:782–790 (1982).
82. Battista G., Cavallucci F, Comba P, Quercia A, Vindigni C, Sartorelli E. A case-referent study on nasal cancer and exposure to wood dust in the province of Siena, Italy. Scand J Work Environ Health 9:25–29 (1983).
83. Riboli E, Bai E, Berrino F, Merisi A. Mortality from lung cancer in an acetylene and phthalic anhydride plant. Scand J Work Environ Health 9:455–462 (1983).
84. Pastorino U, Berrino F, Gervasio A, Pesenti V, Riboli E, Crosignani P. Proportion of lung cancers due to occupational exposure. Int J Cancer 33:231–237 (1984).
85. Dardanoni L, Gafa' L, Paterno' R, Pavone G. A case-control study on lip risk factors in Ragusa (Italy). Int J Cancer 34:335–337 (1984).
86. Buiatti E, Geddes M, Kriebel D, Santuccci M, Biggeri A. A case control study on lung cancer in Florence, Italy. I: Occupational risk factors. J Epidemiol Community Health 39:244–250 (1985).
87. Aurora F, Berrino F, Crosignani P, Braga M, Cireddu C, Musazzi M, Pesci E, Salati M. Esposizioni professionali e tumore del laringe nella USL di Rho. Epidemiol Prev 24:33–36 (1985).
88. Vineis P, Magnani C. Occupation and bladder cancer in males: a case-control study. Int J Cancer 35:599–606 (1985).
89. Magnani C, Nardini I, Governa M, Serio A. Uno studio di coorte degli addetti ad una Officina di Grandi Riparazioni (O.G.R.) delle Ferrovie dello Stato. Med Lav 77:154–161 (1986).
90. Merler E, Baldasseroni A, Laria R, Faravelli P, Agostini R, Pisa R, Berrino F. On the causal association between exposure to leather dust and nasal cancer: further evidence from a case-control study. Br J Ind Med 43:91–95 (1986).
91. Forastiere F, Lagorio S, Michelozzi P, Cavariani F, Arca' M, Borgia P, Perucci C, Axelson O. Silica, silicosis and lung cancer among ceramic workers: a case-referent study. Am J Ind Med 10:363–370 (1986).
92. Vineis P, Terracini B, Ciccone G, Cignetti A, Colombo E, Donna A, Maffi L, Pisa R, Ricci P, Zanini E, Comba P. Phenoxy herbicides and soft-tissue sarcomas in female rice weeders. Scand J Work Environ Health 13:9–17 (1986).
93. Paci E, Dini S, Buiatti E, Seniori Costantini A, Lenzi S, Zappa M. Malignant mesothelioma in non-asbestos textile workers in Florence. Am J Ind Med 11:249–254 (1987).
94. Paci E, Buiatti E, Geddes M. A case-control study of lung tumors in non-asbestos textile workers. Am J Ind Med 11:267–273 (1987).
95. Paci E, Buiatti E, Zappa M, Di Natale M, Vannucchi G, Dini S, Biancalani M. Inquinamento da asbesto nel ciclo tessile pratese: l'evidenza epidemiologica. Med Lav 78:283–292 (1987).
96. Mastrangelo G, Zambon P, Simonato L, Rizzi P. A case-referent study investigating the relationship between silica dust and lung cancer Int Arch Occup Environ Health 60:299–302 (1988).
97. Puntoni R, Bolognesi C, Bonassi S, Merlo F, Mari A, Merialdo G, Santi L. Cancer risk evaluation in an area with high density of chemical plants. An interdisciplinary approach. Ann NY Acad Science 534:808–816 (1988).
98. Musicco M, Sant M, Molinari S, Filippini G, Gatta G, Berrino F. A case-control study of brain gliomas and occupational exposure to chemical carcinogens: the risk to farmers. Am J Epidemiol 128:778–785 (1988).
99. Bimbi G, Battista G, Belli S, Berrino F, Comba P. Studio caso controllo sui tumori nasali e le esposizioni professionali. Med Lav 79:280–287 (1988).
100. Ciccone G, Ronco G, Mirabelli D, Coda O, Troia B, D'Incalci F, Giannassio S, Settimi L, Vineis P. Tumori polmonari ed esposizioni professionali in un'area industriale del nord Italia. Med Lav 79:54–64 (1988).
101. Ronco G, Ciccone G, Mirabelli D, Troia B, Vineis P. Occupation and lung cancer in two industrialized areas on Northern Italy. Int J Cancer 41:354–358 (1988).
102. Parolari G, Merler E, Ricci P. Mortalita' per tumore attribuibile all'esposizione lavorativa ad amianto-amosite in una comunita'. Epidemiol Prev 37:32–37 (1988).
103. Loi AM, Anram DL, Bramanti L, Roselli MG, Giacomini G, Simi U, Belli S, Comba P. Nasal cancer and exposure to wood and leather dust. A case-control study in Pisa area. J Exp Clin Cancer Res 8:13–19 (1989).
104. Donna A, Crosignani P, Robutti F, Betta PG, Bocca R, Mariani N, Ferrario F, Fissi R, Berrino F. Triazine herbicides and ovarian epithelial neoplasms. Scand J Work Environ Health 15:47–53 (1989).
105. Bonassi S, Franco M, Pearce N, Puntoni R. Bladder cancer and occupational exposure to polycyclic aromatic hydrocarbons. Int J Cancer 44:648–651 (1989).
106. La Vecchia C, Negri E, D'Avanzo B, Franceschi S. Occupation and the risk of bladder cancer Int J Epidemiol 19:264–268 (1990).
107. Pasqualetti P, Casale R, Colantonio D, Collaciani A. Occupational risk of hematological malignancies. Am J Hematology 38:147–149 (1991).
108. Merletti F, Boffetta P, Ferro G, Pisani P, Terracini B. Occupation and cancer of the oral cavity or oropharynx in Turin, Italy. Scand J Work Environ Health 17:248–254 (1991).
109. Pasqualetti P, Casale R, Collaciani A, Colantonio D. Attivita' lavorativa e rischio di mieloma multiplo. Uno studio caso-controllo. Med Lav 81:308–319 (1990).

110. Becherini R, Seniori Costantini A, Benelli R, Calistri S, Gasperini MM, Gavazzi M, Masala M, Merler E, Monechi V, et al. Tumori delle vie urinarie escretrici negli addetti all'industria tessile nell'area pratese. Med Lav 82:492–503 (1991).
111. Bovenzi M, Stanta G, Antiga GL, Peruzzo P, Cavallieri F. Occupazione e rischio di tumore polmonare nella provincia di Trieste: uno studio caso-controllo. Med Lav 83:338–348 (1992).
112. Bovenzi M, Stanta G, Antiga GL, Peruzzo P, Cavallieri F. Occupational exposure and lung cancer risk in a coastal area of Northeastern Italy. Int Arch Occup Environ Health 65:35–41 (1993).
113. Comba P, Barbieri PG, Battista G, Belli S, Ponterio F, Zanetti D, Axelson O. Cancer of the nose and paranasal sinuses in the metal industry: a case-control study. Br J Ind Med 49:193–196 (1992).
114. Comba P, Battista G, Belli S, de Capua B, Merler E, Orsi D, Rodella S, Vindigni C, Axelson O. A case-control study of cancer of the nose and paranasal sinuses and occupational exposures. Am J Ind Med 22:511–520 (1992).
115. Forastiere F, Quercia A, Miceli M, Settimi L, Terenzoni B, Rapiti E, Faustini A, Borgia P, Cavariani F, Perucci CA. Cancer among farmers in central Italy. Scand J Work Environ Health 19:382–389 (1993).
116. Franceschi S, Barbone F, Biboli E, Guarnieri S, Serraino D, Talamini R, La Vecchia C. Cancer risk in farmers: results from a multi-site case-control study in North-eastern Italy. Int J Cancer 53:740–745 (1993).
117. Magnani C, Comba P, Ferraris F, Ivaldi C, Meneghin M, Terracini B. A case-control study of carcinomas of the nose and paranasal sinuses in the woolen textile manufacturing industry. Arch Environ Health 48:94–97 (1993).
118. Cocco P, Chierchi R, Chierchi P, Onnis R, Daga G, Pisano M. Problems on inference from hypothesis-generating studies on lung cancer and occupation based on routine hospital records. Med Lav 84:355–361 (1993).
119. Ciccone G, Mirabelli D, Levis A, Gavarotti P, Rege-Cambrin G, Davico L, Vineis P. Myeloid leukemias and myelodysplastic syndromes: chemical exposure, histologic subtype amd cytogenetics in a case-control study. Cancer Genet Cytogenet 68:135–139 (1993).
120. Zappa M, Paci E, Seniori Costantini A, Kriebel D. Lung cancer among textile workers in the Prato area of Italy. Scand J Work Environ Health 19:16–20 (1993).
121. Cocco P, Palli D, Buiatti E, Cipriani F, DeCarli A, Manca P, Ward MH, Blot WJ, Fraumeni JF. Occupational exposures as risk factors for gastric cancer in Italy. Cancer Causes Control 5:241–248 (1994).
122. Barbone F, Franceschi S, Talamini R, Bidoli E, La Vecchia C. Occupation and bladder cancer in Pordenone (north-east Italy): a case-control study. Int J Epidemiol 23:58–65 (1994).
123. Vineis P, Thomas T, Hayes RB, Blot WJ, Mason TJ, Oickle LW, Correa P, Fonthman ET, Shoenberg J. Proportion of lung tumour in males, due to occupation, in different areas of the USA. Int J Cancer 42:851–856 (1988).
124. Costa G, Faggiano F, Lagorio S. Mortalita' per professioni in Italia negli anni '80. Roma: Istituto Poligrafico dello Stato, 1995.
125. Lagorio S, Forastiere F, Rapiti E, Di Pietro A, Costa G. Attivita' economiche e professioni ad elevato rischio di mortalita' per tumore polmonare a Torino (1981–89) e in Italia (1981–82). Med Lav 86:309–324 (1995).
126. Seniori Costantini A, Piratsu R, Lagorio S, Miligi L, Costa G. Studying cancer among female workers: methods and preliminary results from a record-linkage system in Italy. J Occup Med 36:1180–1186 (1994).
127. Ronco G, Costa G, Lynge E. Cancer risk among Danish and Italian farmers. Br J Ind Med 49:220–225 (1992).
128. Parkin DM, Whelan SL, Ferlay J, Raymond L, Young J. Cancer Incidence in Five Continents. Vol VIII. IARC Sci Publ No 143. Lyon: International Agency for Research on Cancer, 1997.
129. Di Paola M, Mastrantoio M, Comba P, Grignoli M, Maiozzi P, Martuzzi M. Distribuzione territoriale della mortalita' per tumore maligno della pleura in Italia. Ann Ist Super Sanita' 28: 589–600 (1992).
130. Bruno C, De Sanctis M, Comba P, Bagnato R. La mortalita' per tumore maligno del peritoneo in Italia: ricerca di correlazioni con l'esposizione ad amianto. Epidemiol Prev 45:39–47 (1990).
131. Merler E, Chellini E. Epidemiologia dei tumori primitivi pleurici. Ann Ist Sup Sanita' 1:133–146 (1992).
132. Giarelli L, Bianchi C, Grandi G. Malignant mesothelioma of the pleura in Trieste, Italy. Am J Ind Med 22:521–530 (1991).
133. Bianchi C, Brollo A, Ramani L, Zuch C. Asbestos-related mesothelioma in Monfalcone, Italy. Am J Ind Med 24:149–160 (1993).
134. Magnani C, Terracini B, Ivaldi C, Mancini A, Botta M. Mortalita' per tumori e altre cause tra i lavoratori del cemento-amianto a Casale Monferrato. Med Lav 87:133–146 (1996).
135. Paci E, Zappa M, Buiatti E, Chellini E, Merler E, Paoletti L, Seniori Costantini A. Further evidence of an excess of risk for malignant mesothelioma in textile workers in Prato area. Br J Cancer 64:377–378 (1991).
136. Vineis P, Seniori Costantini A. Italian multicentric case-control study of hematolymphopoietic malignancies. Med Lav 81:506–512 (1990).
137. International Labour Office. International Standard Classification of Occupation. Geneva:International Labour Office, 1968.
138. ICIT (Index de la Classification International Type par l'industrie de toutes les btaches d'activite economique). Etude Statistiques des Nations Unies, serie M n. 4, add 1, New York, 1975.
139. Ferrario F, Continenza D, Pisani P, Magnani C, Merletti F, Berrino F. Description of a job-exposure matrix for sixteen agents which ar or may be related to respiratory cancer. In: Progress in Occupational Epidemiology (Hogstedt C, Reuterwall C, eds). Amsterdam:Elsevier, 1988; 379–382.
140. Merler E, Alhaique D, Bracci C. Aggiornamento della lista delle malattie professionali. Epidemiol Prev 18:180–183 (1994.
141. Merler E, Brizzi S. Compensation of occupational diseases and particularly of asbestos-related diseases among the European Community (EEC) countries. Epidemiol Prev 18:170–179 (1994).
142. INAIL (National Institute of Assurance against Accidents at Work), personal communication.